

NOTES ON THE SUBGENUS *CHAETOCRUIOMYIA* THEOBALD
(DIPTERA: CULICIDAE).

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(Four Text-figures.)

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Synopsis.

This paper supplements a previous revision of the subgenus *Chaetocruiomyia* Theobald (Marks, 1963). Descriptions and figures are given of both sexes of *Aedes macmillani*, n. sp., male, larva and pupa of *Aedes elchoensis* Taylor, males of *Aedes calabyi* Marks and *Aedes wattensis* Taylor, and egg of *Aedes spinosipes* Edwards. Taxonomy, biology, and distribution of species of the subgenus are discussed and a distribution map is provided.

Mosquitoes of the subgenus *Chaetocruiomyia* Theobald of genus *Aedes* Meigen are known only from Australia. The subgenus was revised by Marks (1963) who recognized 2 species groups, with 7 named species and 2 unnamed forms, viz.:

Group A (Spinosipes-group: *Chaetocruiomyia* s. str.). *A. calabyi* Marks, *A. humeralis* Edwards, *A. moloiensis* Taylor, *A. spinosipes* Edwards, *A. tulliae* Taylor, *A. wattensis* Taylor, "species A", "species B".

Group B (Elchoensis-group). *A. elchoensis* Taylor.

"Species B" was represented by a single female; no further specimens have been taken and its specific status remains uncertain. "Species A", a well-defined species first collected by Dr. Bruce McMillan, was left unnamed in the belief that it was to be described elsewhere; it is now described at the request of Dr. McMillan, who has made available his original series of both sexes, and it is named *Aedes macmillani*, n. sp., in appreciation of his valuable field work on the mosquitoes of Australia and New Guinea.

Since the revision (which included the first description of male terminalia, larva, and pupa of a species of the subgenus—*tulliae*), a series of *Chaetocruiomyia* including males of *calabyi* and *elchoensis*, from the collections of the School of Public Health and Tropical Medicine, University of Sydney, has been received for study through the kindness of Mr. D. J. Lee; Mr. Alan Dyce has recently collected and generously made available males of *wattensis*; and the larva and pupa of *elchoensis* and egg of *spinosipes* have been discovered.

From the foregoing collections, descriptive, biological, and distributional notes are here provided on all species of the subgenus except *moloiensis* and "species B"; the species are treated in alphabetical order. Descriptions here omit subgeneric and species-group characters given in Marks (1963), including the specialized scales or bristles on the thorax and its appendages which are characteristic of species of Group A. The nomenclature used here for larval and pupal setae is the same as in the previous paper.

Unless otherwise stated the specimens examined are in the School of Public Health and Tropical Medicine, Sydney (S.P.H. & T.M.); those recorded in U.Q. are in University of Queensland collection.

AËDES (CHAETOCRUIOMYIA) CALABYI Marks.

Female.

Nine ♀♀ have wing length 1.7–2.0 mm. and agree with the original description except as follows: 1 ♀, Hd. Pendleton, has all scutellar scales dark, hind femur dark ventrally, another has scutal integument dark brown and basal white dorsal patch 1/5–1/4 length of hind tarsal segment IV; 1 ♀, Hd. Senior, has median white scales on head extending from patch at nape in a double row to vertex, one row complete, one interrupted by a couple of dark scales.

Male (Fig. 1, a-c).

Two ♂♂, one headless, differ from ♀♀ as follows: Wing length 1.9–2.0 mm. *Head.*—Antenna as in *macmillani*. Palp scarcely longer than proboscis (excluding labella), black scaled, 2 distal segments down-turned (partly rubbed—setation may be incomplete); a stout dark bristle dorsally at apex of III; IV with 1 long, 1 shorter ventral bristle, a dorsolateral row of about 8 strong dark bristles, and dorsally a double row of shorter square-tipped or forked bristles or narrow scales (about as long as width of segment); V with dark bristles dorsolaterally and at apex. Proboscis 1.5 times length of fore femur. *Thorax.*—Pale scales of scutum whiter than in ♀; long *stp* bristle blunt-tipped, not distinctly forked. Hind femur dark ventrally and posteriorly (except base and apex); tibial bristles rubbed, but apparently as in *macmillani*; mid and hind tibiae dark except for basal pale patch; basal white bands on fore tarsal segments 1/6 I, 1/4 II; on mid tarsal segments 1/8 I, 1/5–1/4 II, a couple of white scales or patch 1/4 III; on hind tarsal segments 1/4–1/3 I, 2/5 II and III, 1/3–2/5 IV; fore and mid tarsal segments IV and V, and tarsal claws as in *macmillani*. Wing partly denuded, C dark at base; broad squame scales on Sc, R₁, and base of Cu in one specimen, on Sc, R₁, M, and one at base of An in the other; cell R₂ 1.6–1.7 times length of its stem; cell M₁ 0.6–0.8 times length of its stem. *Abdomen.*—Tergites II–VII with fairly large median basal white patches, which may touch base only in mid line, III–VII with sublateral subbasal white patches; true tergite VIII dark scaled with white lateral basal patches; sternites I–VII dark scaled with white diagonal patches extending from mid length laterally towards base mesially; coxites inconspicuous, scarcely extending beyond true sternite VIII which is large, with large lateral basal white patches narrowly separated mesially; segments VII and VIII not obviously laterally compressed. *Terminalia.*—Generally similar to *macmillani*; basal lobe extending 3/4 length of coxite, its distal attachment to coxite approximately right-angled; along distal margin of lobe there is a long, strong seta at angle between lobe and coxite, followed by about 4 broad striated setae, and at apex of lobe and extending along distal 2/3 mesially are setae with very broad curved flattened tips, those at apex longest; on inner tergal margin of membranous area on distal 1/4 are 4–5 moderately long setae; sternally coxite bears scattered fine setae on basal half, and mesially towards apex, and a group of about 6 small setae distally on inner sternal margin of membranous area. Style almost 1/2 length of coxite, non-pilose, without setae, slightly swollen on proximal 2/5, slender distally; appendage a little more than 1/2 length of style. Harpago about 1/5 length of coxite, with 2 fine setae near base; appendage 2½ times length of harpago and 4 times as long as its own greatest width, curved and broadly expanded on distal half, with pointed tip. Paraproct with 4–5 fine setae. Lobes of tergite IX small with 2–3 setae; sternite IX bilobed with 1 long and 2–4 short setae to each lobe.

Specimens Examined: SOUTH AUSTRALIA: 1 ♂, 1 ♀ pinned to one mount, Hundred of Pendleton, 28.ii.1952, E. J. Waterhouse; a second ♂ and ♀ pinned to one mount, and 1 ♀, same data; 3 ♀♀ Shinner's Soakage, Hundred of Senior, 11.iii.1952, E. J. Waterhouse; 1 ♀ Hundred of Petherick, 23.ii.1952, E. J. Waterhouse. WESTERN AUSTRALIA: 1 ♀ near Lake King, 24.iii.1955, biting 0630 hrs, E. J. Britten; 1 ♀ near Newdegate, 24.iii.1955, biting 1500 hrs in shade, E. J. Britten.

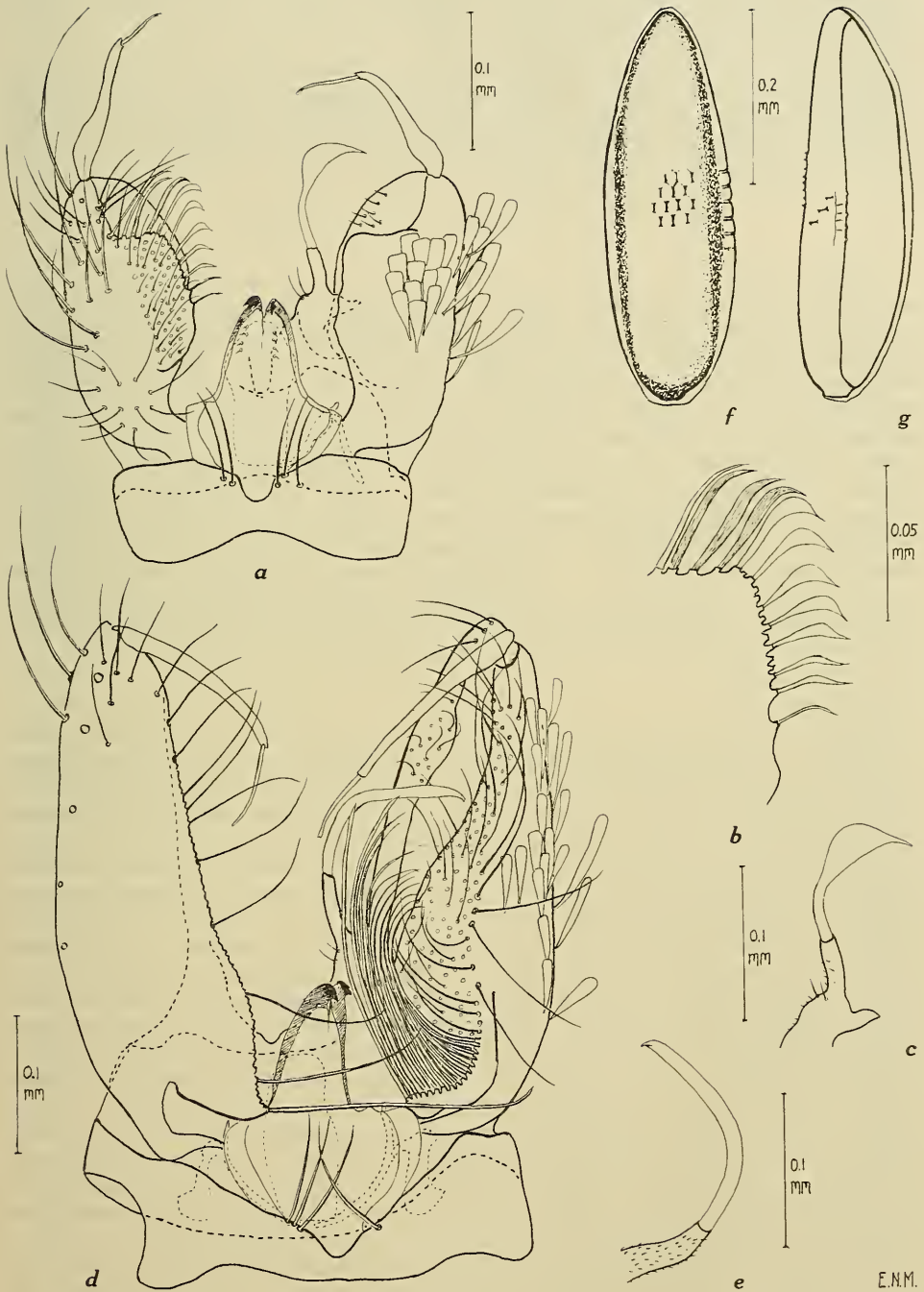


Fig. 1.—*a-c*, *Aedes calabyi* Marks, ♂ terminalia—*a*, tergal aspect; *b*, basal lobe of left coxite, tergal aspect to indicate only shape and extent of specialized setae; *c*, right harpago, inner lateral aspect. *d-e*, *Aedes elchoensis* Taylor, ♂ terminalia—*d*, tergal aspect; *e*, left harpago, inner lateral aspect. *f-g*, *Aedes spinosipes* Edwards, egg (details of surface pattern indicated only at mid length)—*f*, upper aspect; *g*, ventrolateral aspect.

Biology: Waterhouse (1959) describes the area which includes Hundred of Petherick as swamby flats, mostly very saline, and mentions only one tree, red-gum (*Eucalyptus camaldulensis*), in the less saline areas; Hundred of Pendleton is in an area of mallee, heath, broom, and teatree associations.

Comment: The specimens examined from South Australia were recorded by Waterhouse (1959) as "*Aedes* (*Chaetocruiomyia*) undescribed sp.", and the Western Australian specimens are those recorded as *Aedes spinosipes* from the Lake Grace area by Britten (1958); my suggestion (Marks, 1963) that these records were probably referable to *calabyi* is now confirmed.

AËDES (CHAETOCRUIOMYIA) ELCHOENSIS Taylor.

Female.

Fifteen ♀♀ have wing length 1.7–2.4 mm. and show the following differences from my previous description (Marks, 1963). Upper lateral white patch on head reaching eye margin; a few small pale or dark scales mesially on torus; palp 1/2 length of proboscis excluding labella (distal segment 1/2 length of palp). Scutal integument black; *ppn* with 1 or 2 flat or curved white scales below; subspiracular patch of 2–13 broad scales, all but 1 or 2 may be dark; 6 ♀♀ have 1–8 broad scales among the postspiracular bristles, usually white, but may be 1 or 2 black. Fore femur with anteroventral streak of white scales and with posterior broad white streak extending almost to base and apex; mid femur posteriorly with a couple of white scales; hind femur with anterior white streak on distal 2/3; mid tibia with dorsal streak of pale scales on distal 3/5; basal white bands on mid tarsal segments 1/4 I, 1/2 II and III, a couple of white scales on IV and V, or V dark, but not black; basal white bands on hind tarsal segments 1/2 III, 3/5 IV. Tergite VII with paired submedian basal patches of 2 white scales; sternite II white scaled, III, or III–IV with basal white band, IV–VII with small basal lateral white patches, dark scaling as dark as on tergites.

Male (Fig. 1, *d-e*).

One ♂ differs from ♀♀ as follows: Wing length 1.9 mm. Torus large, dark; verticillate hairs dense, dark, lying mainly in a vertical plane. Palp 1 1/5 length of proboscis (excluding labella), black scaled, 2 distal segments slightly down-turned; at apex of segments III and IV a very stout, long, black bristle dorsally, with shorter, finer bristle mesial to it; numerous fine appressed bristles about as long as width of segment mesially along IV and V, 1 long, and 1 shorter moderately strong bristle at apex of V. Proboscis 1 1/4 times length of fore femur, black scaled. Mid lobe of scutellum rubbed, but apparently with some curved white scales; on one side a postspiracular patch of 3 broad white scales. Legs: Fore tibia with 4 rows of about 6 or 7 bristles, of which 2 on basal half of anterior row are strongest, and about 1–1 1/2 times width of tibia. Mid tibia also with 4 rows of bristles, about 10 in anterior row. Hind tibia with dorsal and ventral rows of about 6 strong bristles, the 2 or 3 longest twice width of tibia, an anterior row of 8–9 shorter strong bristles and a row of shorter bristles posteriorly; elongate narrow scales posteriorly along apical 2/3 of hind tibia and base of first tarsal segment; hind tarsal segment III with 1 white scale at apex. Tarsal segment IV on fore leg 1/2 length of V, on mid leg 2/3 length of V; claws of fore and mid legs unequal, anterior long with slender tooth near base, posterior shorter, simple; hind claws equal, simple. *Terminalia* (described and figured from a slightly flattened and twisted mount).—Coxite about 3 1/2 times as long as broad with membranous area along mesial aspect, tergal to which is a densely setose area extending from base almost to apex of coxite, bearing moderately long setae in about 8 longitudinal rows, the more tergal and proximal setae the longest; this setose area merges on basal 1/4 of coxite with a prominent basal lobe, apparently shelf-like, which bears long dense setae, about 3 of which at apex of lobe are stouter, non-striated, 3/5 length of coxite, of uniform width, tapering only at tip. Dense dark scales laterally and sternally on coxite, which also bears scattered long and moderately long setae laterally and near

apex tergally, several mesially directed rows of setae along inner sternal aspect, finer at base, long and strong near apex, and a preapical group of about 10 fine setae on inner sternal margin. Style almost $\frac{2}{5}$ length of coxite, slender, very slightly curved and tapering, non-pilose, without setae; appendage terminal, $\frac{1}{2}$ length of style, slender, with curved, blunt tip. Harpago slender, $\frac{1}{6}$ length of coxite, with 2 fine setae at base; appendage twice length of harpago, and scarcely more slender than it, of even width, strongly curved and finely striated, with short, curved, pointed tip. Paraproct with 1-2 teeth (setae, if present, obscured). Phallosome simple, slightly narrower on distal half, with flattened apex. Lobes of tergite IX scarcely differentiated, bearing 1-3 stout setae; sternite IX with slightly concave distal margin, and 7 setae.

Larva (Fig. 2, a-h).

Colour pale, head light brown, siphon and saddle brown; length about 6 mm. Long setae of thorax and abdomen finely plumose. *Head*.—Almost as long as broad, none of the setae very long. Antenna brown, $\frac{1}{3}$ length of head, 9 times as long as broad, cylindrical, non-spiculate; seta 1 arising at mid length, short, single; 2-6 arising close together at tip, 2 the longest. Head seta 1 a moderately stout, curved, bluntly pointed spine $\frac{1}{3}$ length of antenna; 4 and 6 arising close to front of head, 4 slightly anterior to 6; 5 backwardly directed, arising slightly lateral to 6 and posterior to 7 which arises level with base of antenna; 4 short, 11-12-branched; 5 single, frayed; 6 and 7 2-branched; 8, 10, 13, 14, 15 single (10 duplicated on one side); 11 with 1 strong and 1 weak branch; 12 2-3-branched. Mentum with strong median tooth and 10 large lateral teeth. *Thorax*.—The following setae are long, strong: 5, 6-P, 5, 7, 10, 12-M, 10-T single; 7-P 2-branched; 1-P 2-3-branched; 9-T 3-4-branched; 6-M 4-branched; 9-M 4-5-branched; 8-M 5-branched; 7-T 6-7-branched. The following setae are fairly short and fine: 2, 9, 10, 11, 12-P, 2, 3, 11-M, 2, 5, 6, 11, 12-T single; 3, 8, 14-P, 1-M, 3-T 2-branched; 4-P, 4-M 2-3-branched; 4-T 3-branched; 0-P, 1-T 3-4-branched; 8, 13-T 4-branched; 13-M 4-5-branched; 14-M 5-6-branched. 2-P is longer than 3-P. The long lateral setae arise from sclerotized basal tubercles; basal tubercles of 5, 6-P and of 6, 7-M are fused; basal tubercle of 9-12-M and 9-12-T each bears a very strong spine. *Abdomen*.—Segments I-VII: The following setae are long, strong: 6-V-VI, 7-I, 13 III-IV single, 6-III-IV 2-branched; 6-I-II 3-branched. The following setae are of short to medium length: 2-II-VII, 3-III-IV, VI, 4-II-III, V, 5-V-VII, 7-II-VII, 8-IV-V, 9-II, VII, 10-II-VII, 11-I-VII, 12-II-VII single; 4-VII, 5-II, IV, 9-VI, 13-V, VII 1-2-branched; 8-III 1-3-branched; 1-III-VII, 2-I, 3-I, 4-IV, VI, 5-III, 6-VII, 8-I-II, VII, 9-IV 2-branched; 3-V, VII, 5-I, 8-VI, 9-I, III, V, 13-I 2-3-branched; 13-VI 2-4-branched; 1-I-II, 3-II 3-branched; 4-I, 13-II 3-4-branched. Segment VIII: Setae 1, 2, 4 single, 3 3-4-branched, 5 3-branched; 1, 3 and 5 strong, frayed; 1 arising from sclerotized base of comb; 3 arising from separate sclerotized tubercle. Lateral comb of 4 stout, dark, simple, blunt spines arising from a sclerotized plate, the distal margin of which is slightly indented between the spines; in some spines the heavy sclerotization ends abruptly, leaving a pale tip; longest spines (excluding base) $\frac{1}{4}$ length of saddle. Siphon: Tapering, index 2.2; with a distinct complete dark basal collar and well-developed acus. Pecten extending over basal $\frac{1}{3}$ - $\frac{3}{8}$ length of siphon, of 13-14 fairly even, close set teeth; on one side the proximal tooth arises from the acus; each tooth is coarsely fringed with denticles apically and ventrally; the more basal teeth also have a few denticles dorsally. Seta 1 single, long, strong, frayed, arising at mid length of siphon; valve setae short, seta 8 2-branched. Anal segment: Saddle covering dorsal $\frac{1}{2}$, with distinct sclerotized basal collar, and with several rows of fine spicules along distal margin; the lower distal angle is slightly produced and seta 1 arises from its apex; seta 1 moderately long, single, finely frayed; setae 2-4 long, strong, simple; 2 4-branched; 3 single; 4 (ventral brush) consisting of 10 2-branched setae arising from an incompletely sclerotized grid; anal papillae about $2\frac{2}{3}$ length of saddle, equal, with rounded tips.

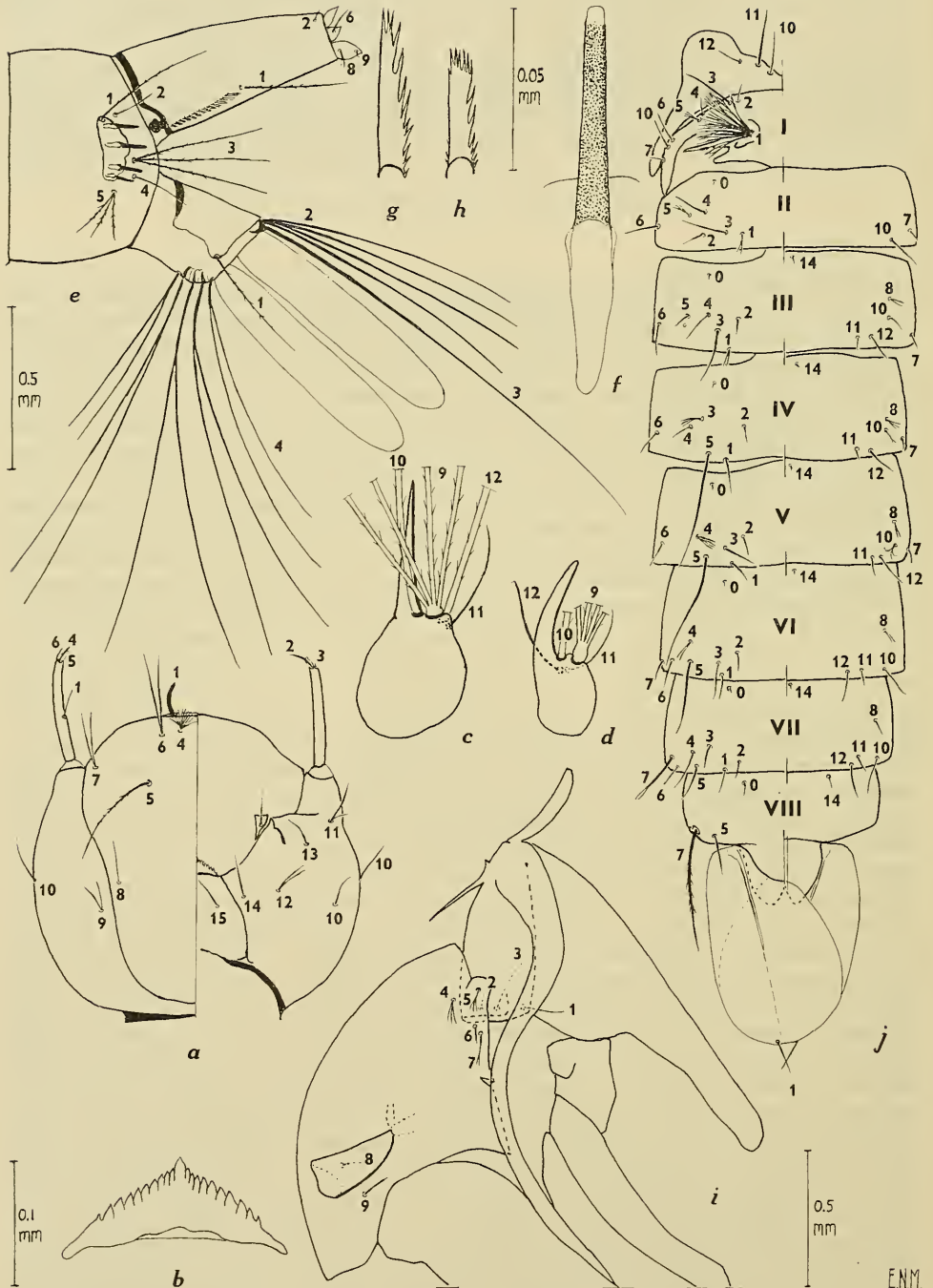


Fig. 2.—*Aedes elchoensis* Taylor: a-h, larva—a, head; b, mentum; c, base of mesothoracic pleural setae; d, base of metathoracic pleural setae (c and d to same magnification as b); e, terminal segments; f, lateral comb tooth; g, distal pecten tooth; h, tooth from middle of pecten. i-j, pupa—i, cephalothorax; j, metanotum and abdomen.

Pupa (Fig. 2, i-j).

Colour pale. The longest setae may be finely frayed. *Cephalothorax*.—Proboscis sheath short (extending little more than half-way to lower margin). Trumpet brown, lighter at base and apex, about $2 \frac{2}{5}$ times as long as greatest width, with slightly oblique opening and shallow apical notch; ratio of meatus to whole 1:1.3. Setae short, simple; setae 1-3, 6, 8-11 single (11 simple or sparsely frayed); seta 4 2-3-branched; seta 5 3-4-branched; seta 7 2-3-branched; seta 12 single or bifid near tip (seta 2 is duplicated on one side). *Abdomen*.—Setae 0-II-VII, 14-III-VII minute, single; 0-VIII, 14-VIII slightly longer, single; 2. 6-I-VII single; 7-I-VI small, single; 11, 12-III-VII single. *Segment I*. Seta 1 strongly developed, dendritic, branches arising from broad fused base; setae 3, 4, 10 single; seta 5 3-4-branched. *Segment II*. Seta 1 2-branched; setae 3, 4, 10 single; seta 5 1-3-branched. *Segment III*. Seta 1 2-branched; setae 3 and 4 single; seta 5 1-2-branched; seta 8 2-3-branched; seta 10 1-3-branched. *Segment IV*. Setae 1, 5 single; seta 3 3-4-branched; seta 4 1-2-branched; seta 8 3-branched; seta 10 2-3-branched. *Segment V*. Setae 1, 3, 5 single; seta 4 4-branched; seta 8 1-2-branched; seta 10 3-branched. *Segment VI*. Setae 1, 3, 5, 10 single; seta 4 2-3-branched; seta 8 2-branched. *Segment VII*. Setae 1, 3, 4, 5, 8, 10 single; seta 7 about half length of segment VIII, stout, bifid at tip. *Segment VIII*. Seta 5 single; seta 7 $\frac{3}{5}$ length of paddle, stout, plumose. *Paddles* oval, with minute sparse spicules on apical margin; midrib slender, distinct on basal $\frac{2}{3}$ only; buttress undeveloped; index 1.6-1.7; seta 1 single, $\frac{1}{5}$ length of paddle.

Specimens Examined: NORTHERN TERRITORY: 11 ♀♀, 1 ♂, Darwin, 1 ♀, 1.iii.1953, 2000 hrs, 10 ♀♀, 1 ♂, 3.iii.1953, 2100 hrs, A. K. O'Gower; 3 ♀♀ 8 miles S. Adelaide River, on N.-S. road, 23.ii.1943, A. R. Woodhill. QUEENSLAND: 1 ♀ (P.2836) with correlated larval and pupal skins, Mt. Molloy, 28.x.1962, E. N. Marks and G. Barrow (U.Q.).

Biology: The localities from which *elchoensis* has been collected all lie between the 40-inch and 60-inch isohyets. All females for which time of biting is recorded were taken at night.

At Mt. Molloy (alt. 1300 ft.) the collecting site was in open forest with numerous small trees, principally *Eucalyptus alba* and *Melaleuca* spp. A dry hollow, $\frac{1}{2}$ inch \times $\frac{3}{4}$ inch across, 8 inches deep, and 1 foot above ground level, in a small *E. alba* was filled with water at approximately 1700 hours on 27th Oct. From a collection made from it 24 hours later 3 larvae were reared, 2 *Aedes tremulus* (Theobald) and 1 *elchoensis*; the latter pupated on 8th Nov. and the adult emerged on 13th Nov. *Chaetocruomyia* adults (*moloiensis* also occurs here) may be fairly common in the Mt. Molloy area during the wet season, for residents who spend much time in the bush, when asked about local mosquitoes, gave special mention to the little mosquitoes with white backs which are vicious biters.

Dr. O'Gower informs me that the site at Darwin where he collected 11 specimens on 3.iii.1953 was on the edge of the town at Berry Springs, a series of swimming pools in a limited area of wet sclerophyll eucalypt forest with some *Pandanus*; the trees had been thinned to make the pools more accessible; light intensity was low and humidity high.

Comment: The larva and pupa of *elchoensis* key to subgenus *Macleaya* in Mattingly's (1959) keys. The larva closely resembles those of species of *Macleaya* in the placing of head seta 12 mesial to seta 13, and in the form of lateral comb; it differs in having very large spines on bases of both meso- and metathoracic pleural setae (some species of *Macleaya* have a fairly large spine on base of the mesothoracic group, but none have more than a short spine on the metathoracic) and a well-developed acus on the siphon. The larva resembles that of *tulliae* in having abdominal seta 13 very long on segments III and IV; it differs in the form of lateral comb, base of siphon, and pecten; moreover *tulliae* has head seta 12 arising lateral to seta 13. thoracic seta 1-M very long; and bases of meso- and metathoracic pleural setae without large spines. The pupa shows no distinct differences from pupae of *Macleaya* species.

which, however, have not yet been studied in detail; it differs from the pupa of *tulliae* in having seta 7 not strongly developed on segments III-VI, and paddle seta 1 short.

Male terminalia of *elchoensis* show affinities with some or all species of *Macleaya* (several of which are undescribed) in the shape of tergite IX, sternite IX, and appendage of harpago, and in the basal lobe and setose area of coxite; they appear to differ in the shape of apex of phallosome; they differ from other species of *Chaetocruiomyia* in all these characters. The male palp also resembles *Macleaya* species rather than other species of *Chaetocruiomyia*.

Except in adult scale pattern, *elchoensis* appears to be nearer to *Macleaya* than to Group A of *Chaetocruiomyia*, but any reconsideration of its subgeneric position seems best left until the subgenus *Macleaya* has been revised.

AÈDES (CHAETOCRUIOMYIA) HUMERALIS Edwards.

Female.

Eight ♀♀ have wing length 1.7-2.2 mm. and show the following differences from my previous description (Marks, 1963): Head extensively pale scaled, lateral dark scale patch not reaching nape; no narrow curved scales at nape; torus with numerous pale scales mesially. Scutum with golden brown scaling extending forward as a broad median stripe only to level of scutal angle, merging anteriorly with creamy scales which are darker than the white scaling of fossae; 4 specimens have 1-3 narrow curved or broad scales on postspiracular area, and though all 4 are damaged to some extent, on 3 the broad scales at least appear to be *in situ*. Tergite I entirely dark scaled mesially.

Specimens Examined: QUEENSLAND: 5 ♀♀ Eidsvold, T. L. Bancroft, 2 of which are labelled "Aedes (Chaeto.) humeralis Edw. Paratype id. by G. F. Hill" and are presumably part of the original series of 5 ♀♀ described by Edwards; 3 ♀♀ without locality data, one of which is labelled in Bancroft's hand "No. 3 New Stegomyia". These do not appear to include any of the 4 Eidsvold ♀♀ on which I made notes at S.P.H. & T.M. in 1945.

Comment: Presence of postspiracular scales had not previously been observed in *Chaetocruiomyia*; their absence can no longer be considered a reliable subgeneric character.

AÈDES (CHAETOCRUIOMYIA) MACMILLANI, n. sp.

Aedes (*Chaetocruiomyia*) "Species A" of Marks (1963).

Female (Fig. 3, a).

Subgeneric characters and those common to species of Group A listed by Marks (1963) are omitted from the following description. Wing length 2.7-2.8 mm. (2.7 mm. in holotype). *Head.*—Flat white scales at nape mesially, not extending in a continuous triangle to vertex, but sometimes reaching eye margin sublaterally (as in holotype), separated by a broad sublateral area of black scales from lateral pale scaling; a continuous band of flat black scales dorsally behind eyes, often with mottling along its junction with posterior pale scaling; small creamy scales along eye margin, narrow curved, with sometimes some flat at vertex; some narrow curved pale scales at nape; upright forked scales dark; clypeus brown. *Thorax.*—Integument reddish-brown. Scutum clothed with creamy scales anteriorly, deeper creamy between acrostichal and dorsocentral bristles; posterior margin of pale scaling follows posterior margin of fossa, and is slightly indented at dorsocentral and extended at acrostichal bristles; posterior scutal scaling brown, with golden scales round prescutellar bare area, and in double line lateral to prescutellar bristles; a few golden scales above wing root; short creamy and longer dark forked bristles in front of wing root. Scutellum with narrow curved creamy scales only on all lobes (as in holotype), or with 2-3 flat pale or dark scales mesially on mid lobe; 4-5 strong bristles to each

lobe. *Apn* with narrow curved creamy scales above and below a patch of flat dark scales. *Ppn* with narrow curved dark scales only, or with some flat dark and with a few narrow curved creamy above or below. Subspiracular scale patch small, of about 5-8 white scales, usually all flat, sometimes a few narrow. Legs: Fore femur anteriorly with short pale streak or extensive pale scaling on basal half, posteriorly with large pale patch on middle 1/3, mottling beyond it, and large apical patch, or mainly pale on apical 2/3 and mottled on basal 1/3. Mid femur anteriorly dark; ventrally with pale scaling almost continuous from base to apex, merging at mid length with a large posterior pale patch which extends as a streak, sometimes with associated mottling, towards base and apex; a small complete preapical dark ring and small posterior apical pale patch. Hind femur dark with ventrally a few scattered pale scales or mottled streak, and sometimes posteriorly a few pale scales at mid length. Fore tibia posteriorly with some scattered pale scales, or extensively pale on basal 2/3 with pale patch at apex. Mid tibia dark or with extensive mottling of pale scales dorsally and some posteriorly. Hind tibia dark. Basal white bands on fore tarsal segments 1/6-1/5 I, 1/3-2/5 II; on mid tarsal segments 1/7-1/5 I, 1/3-2/5 II; on hind tarsal segments 1/4 I, 1/3-2/5 II, 2/5-1/2 III, IV all dark, V all white, or with a few dark scales at apex (as in holotype). Wing: Pale scales in small patch at base of C, with 1 or 2 beyond it; cell R_2 2.3-2.9 times length of its stem; cell M_1 0.8-1.2 times length of its stem. *Abdomen*.—Tergite I dark scaled mesially; II-VII with fairly large median basal creamy patches; VIII in holotype with basal band not reaching lateral margin (retracted in most specimens).

Described from holotype and 3 paratype females.

The following differences were observed among specimens from other localities: 4 ♀♀, Colo Vale—wing length 2.6-2.7 mm.; scutellar scales all golden, narrow curved, or broad curved, or the two mixed, or with 1-2 dark curved or flat mesially on mid lobe; subspiracular scale patch short, irregular, of 5-12 white scales; 7 upper *stp* bristles; mid tibia with continuous pale dorsal streak not reaching base and apex; a white scale at base of fore tarsal segment V; basal band 1/4 mid tarsal segment III; base of C dark or with a couple of pale scales; cell R_2 3 times length of its stem; terminalia of 1 ♀ examined, similar to *spinosisipes*. 1 ♀, Kangaroo Valley—wing length 2.9 mm. 7 ♀♀, Victorian localities—wing length 2.5-2.9 mm.; mid lobe of scutellum with broad curved creamy scales, those in mid line darker; *ppn* scales mainly flat black; basal white band 1/2 fore tarsal segment II, a few white scales at base of III; a patch at base of mid tarsal segment III; band 1/2 length of hind tarsal segment III; 1-2 pale scales mesially at base of tergite I. The foregoing are all from south of the type locality and the following from north of it. 1 ♀, Guyra—wing length 3.1 mm. 2 ♀♀, Point Lookout—wing length 2.6-3.1 mm.; scutal integument dark brown; median patches on tergites white. 2 ♀♀, Ben Lomond—wing length 3.0-3.1 mm.; scutal integument dark brown; mid femur anteriorly with a few white scales at mid length; basal white bands half fore tarsal segment II, quarter mid tarsal segment III; otherwise these 2 ♀♀ agree with the type series, more particularly they have anterior scutal scaling deep creamy, scutellar scales all pale curved, or mid lobe with some flat black in mid line, *apn* with narrow curved creamy scales above, subspiracular scale patch small, white, and some pale scales at base of C. 5 ♀♀, Ben Lomond—wing length 2.5-2.8 mm.; scutal integument medium to dark brown (reddish-brown under strong light); all pale scaling of scutum and scutellum white, or at least fossae white, rest very pale creamy; sparse pale scales round prescutellar bare area; mid lobe of scutellum clothed mainly with flat dark scales, with a few narrow curved dark or pale laterally, lateral lobe with narrow curved dark and pale scales, or scutellar scales all narrow curved, a few dark mesially on mid lobe, rest pale; *apn* mainly dark scaled, without pale scales above, or with only a couple of narrow curved white or creamy, and with narrow curved and sometimes flat white scales below; subspiracular scale patch of 7-12 scales, sometimes divided into a lower patch of broad scales and upper patch of 2-4 narrow elongate scales, all scales white in 2 ♀♀, mainly white with

a few dark in 2 ♀♀, all dark in 1 ♀; fore tarsal segment III with 1-2 white scales at base; mid tarsus with basal band 1/4 segment II, basal white patch on III; hind tarsus with white band 1/2 segment III; base of C dark; tergite I with 1 white scale mesially at base in 2 ♀♀; mesial patches on tergites white in 4 ♀♀, pale creamy in 1 ♀.

Male (Fig. 3, b-d).

Allotype and 2 paratype ♂♂ differ from ♀♀ as follows: Wing length 2.8-3.3 mm. *Head*.—Torus large, dark, with fine hairs mesially; verticillate hairs long, dense, dark brown, lying mainly in a vertical plane. Palp 1.1 times length of proboscis (excluding labella), black scaled, the 2 distal segments slightly down-turned; segment III at apex with 2 stout dark bristles dorsally, the mesial one shorter, and 4 long fine bristles ventrally; segment IV with numerous long bristles dorsolaterally, a stout apical bristle mesially, a ventral row of about 10 long bristles, and a few short unmodified bristles dorsally; segment V with numerous moderately long bristles dorso-laterally, ventrally and at apex. Proboscis 1.5 times length of fore femur. *Thorax*.—Integument dull medium brown (reddish in strong light); anterior scutal scaling pale creamy, posterior light brown, golden and creamy. Scutellum with curved creamy scales; some flat black in middle of mid lobe. *Apn* with a couple of narrow curved creamy scales above, elongate and flat dark mesially, narrow curved and flat white below. *Ppn* with a few narrow curved or elongate flat white scales below dark scaling. Subspiracular scale patch of 7-15 white scales, mainly broad, 2-3 narrow above. One paratergite of allotype bears a single broad curved white scale, which may be displaced from group in front of wing root. *Legs*: Fore tibia with about 6 well separated bristles anteriorly, posteriorly, dorsally and ventrally, the 2 longest anteriorly about 2½ times width of tibia. Mid tibia with anterior row of about 15 long bristles, the 2 or 3 longest about 2½ times width of tibia, dorsal and ventral rows of about 6 bristles, and a row of fine short bristles posteriorly. Hind tibia with rows of 3-4 very long, and some shorter strong bristles dorsally and ventrally (the longest 3 times width of tibia), anterior and postero-dorsal rows of about 18-20 moderately long bristles; some long narrow scales posteriorly along tibia and at base of tarsal segment I. Basal bands on fore tarsal segments 2/5-1/2 II, sometimes a patch at base of III; on mid tarsal segments 1/7-1/6 I, 1/4-1/3 II, sometimes a white scale at base of III; on hind tarsal segments 1/5-1/4 I, 1/4-1/3 II, 2/5 III, IV dark or with a white scale at base, V may have numerous dark scales on distal half; fore and mid tarsal segments IV and V approximately equal, not obviously modified, with unequal claws, anterior long with a slender tooth near base, posterior simple; hind claws equal, simple. C dark at base. *Abdomen*.—Tergites with numerous long hairs laterally and apically; tergite I mesially dark or with small white basal patch; II-VII with large median basal white patches; sublateral white patches distinctly subbasal on III-VI; true tergite VIII dark scaled; true sternite VIII with sublateral white patches, coxites scarcely projecting beyond it, small, dark scaled. *Terminalia* (described from 2 paratypes).—Coxite about 2 1/3 times as long as greatest width, with membranous area along mesial aspect, tergal to which is an elongate basal lobe extending 2/3 length of coxite, its distal attachment to coxite approximately right-angled. Dense scales laterally on coxite, extending onto sternal aspect and onto middle third tergally. Basal lobe densely clothed with moderately long setae, fewer and finer on mesial basal portion; on distal margin of lobe there are 2-4 long, strong setae at angle between lobe and coxite, followed by 2-4 broad striated setae, and at apex of lobe and extending along distal 1/3 mesially are setae with curved, flattened tips, those at apex the longest. On inner tergal margin of membranous area on distal 1/3 are 4-5 moderately long setae. Coxite bears numerous long setae laterally, and on distal 1/3 sternally (the longest as long as coxite); a group of about 10 moderately long setae tergally at base; scattered fine setae on middle third sternally and extending mesially towards apex, those on inner sternal margin not forming a distinct group. Style 1/2 length of coxite, pilose on basal 1/6, with 2 fine preapical setae, or without setae; fairly straight, slender, slightly tapering; appendage terminal,



Fig. 3.—*a-d*, *Aedes macmillani*, n. sp.: *a*, ♀ head and scutal pattern; *b-d*, ♂ terminalia—*b*, tergal aspect; *c*, distal portion of basal lobe of left coxite, tergal aspect, to indicate only shape and extent of specialized setae; *d*, right harpago, inner lateral aspect. *e-j*, *Aedes wattensis* Taylor: *e-g*, ♂ tarsal claws—*e*, fore (untoothed anterior claw is abnormal); *f*, mid; *g*, hind; *h-j*, ♂ terminalia—*h*, tergal aspect; *i*, basal lobe of right coxite, inner lateral aspect; *j*, right harpago, inner lateral aspect.

almost $3/5$ length of style, slightly curved, with unfurled grooved tip. Harpago $1/5-1/4$ length of coxite, with 2 fine setae near base; appendage about twice length of harpago, and 3 times as long as its own greatest width, lightly sclerotized, curved and broadly expanded on distal $2/3$, with short pointed tip. Paraproct with a single tooth and 2-3 fine setae. Phallosome simple, straight sided basally, widening beyond mid length, with rounded apex. Lobes of tergite IX small, with 3-5 setae; sternite IX bilobed with 1-2 long and 2 short setae to each lobe.

Types: Holotype ♀, Barrington area (Gummi Plain), N.W. Dungog, New South Wales, 3800 ft., 3.iii.1951, biting, B. McMillan; allotype ♂, 3 ♀♀, 2 ♂♂ paratypes, same locality, 1 ♀, 1 ♂ same date, allotype and 2 ♀♀, 1 ♂, 2.iii.1951. Holotype, allotype, and 4 paratypes in S.P.H. & T.M., 1 ♂ paratype in U.Q. The allotype is the only practically perfect and undissected male *Chaetocruiomyia* in known collections.

Specimens Examined: The type series; 4 ♀♀, Ben Lomond, off dog, E. J. Waterhouse, 3 ♀♀, 3.iii.1956, one 0530-35 hrs, one 0540-45 hrs, one 0602 hrs; 1 ♀, 15.iii.1956, 0645 hrs. Detailed notes on specimens previously listed (Marks, 1963) have also been used in descriptions.

Distribution (details in Marks, 1963): NEW SOUTH WALES: Ben Lomond, Guyra, Point Lookout, Barrington Area, Colo Vale, Upper Kangaroo Valley. VICTORIA: Orbost, Sherbrooke Forest, Lyonville, Tidal River. Dr. N. V. Dobrotworsky (personal communication) has taken *macmillani* on Flinders I., Bass Strait.

Biology: No further details can be added to the previous account (Marks, 1963), except to note the early morning biting at Ben Lomond. This is the *Chaetocruiomyia* species of the wetter and cooler areas of south-east Australia, and its distribution is not known to overlap that of any other species of the subgenus.

Comment: Although Ben Lomond specimens show a good deal of variation, there is a gradation in some variations and some are represented in specimens from other localities; different characters also are affected in different specimens. There seems no reason to suppose more than the one species, *macmillani*, is represented in this series. Perhaps greater variability may be associated with specimens from the northern limits of its range, but most localities are represented by too few specimens to indicate local variation.

AËDES (CHAETOCRUIOMYIA) SPINOSIPES Edwards.

Female.

Thirty-one ♀♀ have wing length 1.8-2.4 mm. and show the following differences from my previous description (Marks, 1963). Flat scales of head almost all white, dark patches reduced to a few scales; some creamy scales mesial to and lateral to prescutellar bristles, on mid lobe of scutellum laterally, and on lateral lobe; 8 upper *stp* bristles; pale scales on C usually extending to level of tip of scale tuft, sometimes twice that distance, often some also on Sc beyond tip of scale tuft; tergite IX with submedian groups of 2-3 setae; insula with 10 setae.

Egg (Fig. 1, *f-g*).

Described and figured from darkened eggs dissected from adults. Length 0.475 mm., greatest width 0.15 mm.; elongate oval in upper view, the micropylar end the more rounded. The lower surface (width about $1/3$ circumference of egg) is flattened and lightly sclerotized, apparently smooth with a fine reticulate structure. The upper surface is more heavily sclerotized, the sclerotization continuous below round each end, and the lateral junction with the lower surface sharply defined, and appearing as a scalloped border. The upper surface appears when immersed to be marked with a series of fairly regularly spaced, elongate sclerotizations, each like a "capital I", the upper ones lying mainly parallel to, and the lateral ones at right angles to long axis of egg. These sclerotizations form the sides of hexagonal reticulations which cover the upper surface, the diagonal lines joining them being usually more lightly sclerotized,

and not obvious at low magnifications. When the egg is dried, the surface appears rugose, the tuberosities being at each end of each "capital I".

Specimens Examined: QUEENSLAND: 1 ♀ Palm I., G. F. Hill; 1 ♀ Palm I., xi.1920, A. Breinl; 1 ♀ Eungella, 50 miles W. Mackay, alt. 2300 ft., F. H. Taylor; 4 ♀♀ labelled "Loc. doubtful ? Palm Is."; 2 ♀♀ unlabelled; 2 ♀♀ Noosa, 13.iii.1963, E. N. Marks and G. Monteith. Noosa specimens in U.Q. (some will be distributed to other institutions), remainder in S.P.H. & T.M. Palm I. specimens are not those on which I had previously made notes. Eungella is a new locality record.

Biology: Eungella has extensive rainforests and an average annual rainfall of 68 inches.

A small rainforest area at Noosa where *spinosipes* had been collected twice previously was visited after rains in March, 1963, with the object of trying to locate its breeding places and of collecting adults. Collections from small tree cavities at heights of 2 feet to 35 feet above ground did not yield larvae of this species, and no adults were taken in two New Jersey light traps, one run 1800 hrs (dusk)—2200 hrs and one dusk-dawn. Between 0830 and 1245 hrs on 13th March, in overcast, humid, damp and sometimes showery conditions, 22 ♀♀ were taken biting in this rainforest, one at 30 feet above ground, but most at ground level attacking the collectors' feet and ankles.

Most of these adults were held in a small cage, some in vials, and all were transferred about 2000 hrs to a 9 inch × 9 inch × 9 inch cage in the laboratory, where they were kept thereafter at room temperature, and in fairly high but variable humidity. A porous flower-pot with base immersed in water, a Petri dish with moist cotton wadding, and two narrow glass vials with moist filter paper (one moistened with tree-hole water, and darkened by wrapping it externally) were provided as oviposition sites, but no eggs were found in them.

An arm was inserted in the cage twice on 14th March, 1200–1210 hrs and 1330–1345 hrs, about 8 engorged; once on 15th, 4 or 5 fed; twice on 18th, none fed; on 21st at 0945 hrs, 1 fed; on 22nd and 25th, none fed. Fruit, sugar solution, and water were also available; on 22nd specimens were feeding on apple and on 25th some specimens appeared engorged with liquid.

Dead adults were removed from the cage when observed—14th, 2; 15th, 2; 18th, 3; 19th, 3; 21st, none dead in morning, 1 in afternoon; 25th, 1; 26th, 2; 27th, in morning 4 dead, 1 moribund, in afternoon, 1 dead, 1 moribund, and the single survivor was killed.

Spermathecae of the specimen moribund on morning of 27th were examined and appeared to contain non-motile sperm. Two drowned specimens, preserved in alcohol, were subsequently found to contain respectively 22 and 25 well-developed eggs. Their abdomens were not obviously distended with eggs and it is probable that some of the specimens pinned were also gravid. It seems clear from the structure of the eggs that they would normally be laid where they would adhere to a firm surface.

AÈDES (CHAETOCRUIOMYIA) TULLIAE Taylor.

Larva.

Four specimens in U.Q. show the following differences from my previous description (Marks, 1963): Length 7.5–8.5 mm.; seta 1-P 2-3-branched; 13-I stout or fine in specimens from same site; upper anal papillae twice length of saddle.

Specimens Examined: QUEENSLAND: Silver Plains, Port Stewart, 1 larva, 1 larval skin, tree hole 23 ft. above ground in bloodwood tree, clean water, 24.iv.1963; 1 larva, 1 larval skin, treehole in big bloodwood tree, dirty water, 26.iv.1963, J. L. Wassell.

Distribution: Known only from north Queensland localities previously recorded (Marks, 1963), with over 40-inch annual rainfall. O'Gower's (1958) record of *tulliae* from Northern Territory was based on specimens now identified as *wattensis* and discussed under that species.

AÈDES (CHAETOCRUIOMYIA) WATTENSIS Taylor.

Female.

Ten ♀♀ have wing length 1.4–1.9 mm. and show the following differences from my previous description (Marks, 1963): Pale scales on posterior half of scutum reduced to a short line lateral to prescutellar bristles; mid femur posteriorly with only a few scattered white scales near middle; hind femur dark ventrally; white basal bands on mid tarsal segments 1/2 II–III, on hind 2/5 I; no pale scales mesially on tergite I.

Male (Fig. 3, e-j).

Two ♂♂, one pinned, one on slide, are too denuded for a close comparison with characteristic head and thoracic scaling of ♀♀; most observable characters agree with *wattensis* and differences are similar to those between sexes in other species; their identification is, however, based principally on association—the two sexes were taken at the same site on the same or consecutive days, and no other species of *Chaetocruiomyia* are known from this locality. They differ from ♀♀ as follows: Antenna as in *macmillani*; palp black scaled, segments I–IV equal in length to proboscis (excluding labella), V lost, remaining bristles on III and IV as in *macmillani*, apparently no square-tipped bristles dorsally on IV; proboscis (excluding labella) 1.6 times length of fore femur; head scaling denuded, but 1 ♂ has flat black scales mesially at vertex. Legs: Bristles partly denuded; hind tibia with anterior row of about 15 and posterodorsal row of 12 moderately strong bristles, possibly very long bristles dorsally and ventrally have been lost but their bases are not apparent; white basal bands on fore tarsal segments 1/8 I, 1/4 II, on mid tarsal segments 1/8 I, 1/4 II, a patch on III, 1 white scale on IV, on hind tarsal segments 1/4 I, 1/3 II, 2/5 III, 1/3 IV; fore and mid tarsal segments IV and V and tarsal claws as in *macmillani*, but in 1 ♂ anterior claw on one fore leg lacks a basal tooth. Wings: Cell R_2 1.5–1.6 times length of its stem, cell M_1 0.6–0.7 times length of its stem. *Terminalia*.—Generally similar to *macmillani*; coxites extending straight beyond segment VIII; basal lobe extending 2/3 length of coxite, its distal attachment to coxite approximately right-angled; along distal margin of lobe there are 1–2 long setae at angle between lobe and coxite followed by a row of 5–6 broad striated scale-like setae (appearing dark in uncleared specimen) with curved pointed tips, and a further 5–6 smaller striated setae in the two rows proximal to these; at apex of lobe and along distal 1/2–2/3 mesially the striated setae are succeeded by setae with very broad, curved, flattened tips, and setae in 1–2 rows lateral to these have narrower flattened tips; bases of all these modified setae lie in a triangle with its apex at apex of lobe; on inner tergal aspect of membranous area on distal 1/3 are 4–5 moderately long setae; sternally coxite bears scattered fine setae on basal half, and mesially towards apex, with an ill-defined group of 7–10 setae pre-apically on inner sternal margin of membranous area. Style almost half length of coxite, pilose on basal 1/6, without setae, slightly curved and tapering; appendage about 3/5 length of style. Harpago 1/5 length of coxite with 1–3 fine setae near base; appendage 2½ times length of harpago and 6 times as long as its own greatest width, curved and expanded on distal 2/3, with pointed tip. Paraproct with 4–5 fine setae. Lobes of tergite IX with 2 setae; sternite IX bilobed with 1–2 long and 2 short setae to each lobe.

Specimens Examined: NORTHERN TERRITORY: 2 ♀♀ Roper River Mission, biting in house, one 0630 12.xi.1956, one 16.xi.1956, A. K. O'Gower. QUEENSLAND: 1 ♀ Lawn Hill, 90 miles S.W. Burketown, Saville Plain, 14.v.1931, T. G. Campbell; 2 ♀♀ Acton Station, 20 miles N. Richmond, biting indoors, one 1840 hrs, 5.xi.1962, one 1800 hrs, 6.xi.1962, E. N. Marks; 1 ♀ Goondiwindi, 16.iv.1951, F. N. Ratcliffe; 2 ♀♀, 2 ♂♂ Noondoo, ♂♂ light trap, one 25.ii.1963, one 26.ii.1963, 1 ♀ to man, sunrise, 1 ♀ biting man 0800 hrs, 26.ii.1963, A. L. Dyce. NEW SOUTH WALES: 1 ♀, Cobar; 1 ♀, Lake Urana, rabbit warren, 1730 hrs, 10.iii.1954, A. L. Dyce. With the exception of Noondoo and Lake Urana, these are new distribution records. Noondoo ♂♂ in Australian National Insect Collection, Canberra, ♀♀ returned to A. L. Dyce; Richmond specimens in U.Q.; remainder in S.P.H. & T.M.

Biology: Average annual rainfall is 28 inches at Roper River Mission, 20 inches at Lawn Hill, 18 inches at Richmond, 24 inches at Goondiwindi and 12½ inches at Cobar.

Richmond specimens were taken on hot, dry, sunny afternoons, in a room with louvres open to a garden containing large trees, close to a dry watercourse fringed by numerous large coolibah (*Eucalyptus microtheca*) and boree (*Acacia cana*) trees, beyond which was savannah; all treeholes examined were dry; some of those experimentally filled with water later yielded *Aedes* (*Macleaya*) spp. larvae, but many small holes were inaccessible; no adults of *wattensis* were taken in a light trap run from dusk to dawn close to the collecting site.

Noondoo males are the first specimens of *Chaetocruiomyia* known to be taken in a light trap, and Dyce (*in litt.*) gives the following notes on the locality: The plant association was dominated by bumble box (*Eucalyptus populnea*) and wilga (*Geijera parviflora*) with some false sandalwood (*Eremophila mitchellii*) but no conspicuous *Acacia* component. He also comments that Urana has no mallee that he saw; Myers' study sites, where timbered, carried open pine (*Callitris columellaris*) and eucalypts, around the lake margin *Eucalyptus camaldulensis*, and further back *E. populnea*. The Urana record from a rabbit warren is the first indication of resting places of *wattensis*.

Comment: In 1957 I identified a Roper River specimen as "*A tulliae*?" and, as a result, O'Gower (1958) recorded *tulliae* from Northern Territory. Re-examination of this and a second specimen shows that they are not *tulliae* but *wattensis*, which was not previously known from Northern Territory. One of the males described above differs from females in having dark scales at vertex, but this is not considered significant, as a similar difference occurs between the sexes in *tulliae* (Marks, 1963); this male would not run to *wattensis* in my key to adults, but any revision of the key must await less damaged specimens.

DISCUSSION.

Males. Males of four species of Group A are now known and terminalia characters provide further evidence of the close relationship between species of this group. The differences between species lie mainly in the shape of the appendage of the harpago, and the shape and extent of specialized setae on the basal lobe of the coxite; there may be differences in the shape of the style, and in the angle of attachment of the basal lobe to the coxite; but the appearance of this angle might be affected by the degree to which the mount has been flattened. The specialized setae of the basal lobe are best seen in an inner lateral view of the coxite after the terminalia are bisected, but it has been possible to examine only one specimen thus. There are apparent differences on the bristles of the palp between *calabyi* and other species, but these need checking on a larger series.

Subgeneric Characters. The subgeneric characters previously given (Marks, 1963, p. 191) now need modification. For the adult ♀, "postspiracular area unscaled" should be deleted, since postspiracular scales are sometimes present in *elchoensis* and *humeralis*. For the adult ♂, substitute "broad squame scales may be absent from Cu and An" for "no very broad squame scales on Cu and An"; and substitute for the terminalia characters (which are those of Group A) "Coxite with well developed basal lobe; style with terminal appendage; appendage of harpago of uniform width or with broad blade; phallosome simple".

It does not now appear practicable to find larval and pupal characters common to both subgroups of *Chaetocruiomyia* which will distinguish the subgenus from *Macleaya*. The subgeneric characters previously given apply to a larva and pupa of Group A ("seta 12 of III-V very long" should read "seta 13 . . .").

Species Group Characters. The following may be added to those previously listed (Marks, 1963, p. 193).

Group A. ♂: Palp with a row of long bristles dorsolaterally on segment IV; fore and mid tarsal segments IV and V approximately equal; coxite with elongate basal lobe extending more than half length of coxite; appendage of harpago broadened, blade-like; phallosome broadest on distal half, apex rounded. Larva: Head seta 12 arising lateral to 13; lateral comb a patch of fringed scales.

Group B. ♂: Palp without long bristles dorsolaterally on segment IV; fore and mid tarsal segment IV distinctly shorter than V; coxite with shelf-like basal lobe on basal



Fig. 4.—Distribution of *Chaetocruimyia* species (capital letter indicates type locality): B, "species B"; C, *calabyi*; E, *elchoensis*; H, *humeralis*; L, *moloensis*; M, *macmillani*; S, *spinosipes*; T, *tulliae*; W, *wattensis*.

quarter; appendage of harpago of uniform width; phallosome broadest on basal half, apex flattened. Larva: Head seta 12 arising mesial to 13; lateral comb a row of simple spines arising from a sclerotized plate.

Biology. In summary, the following is known of the biology of *Chaetocruimyia* species: Breeding places are narrow treeholes, 1 inch or less in diameter, 1 ft. (*elchoensis*) to 30 ft. (*tulliae*) above ground. Eggs probably adhere to the sides of these holes. Larvae may be obtained by filling a dry breeding place with water and siphoning it out 24 hours later (*elchoensis*). *A. elchoensis* is mainly a night-biting mosquito; species of Group A usually bite by day, occasionally at night (*tulliae*), from ground level to 30 ft. above ground (*spinosipes*), and will enter houses; they have been taken biting man, dog (*macmillani*) and horse (*tulliae*), resting on a tree trunk (*macmillani*) and in a rabbit warren (*wattensis*). Wild caught females can survive up to two weeks in a laboratory cage (*spinosipes*), feed in captivity on blood and on fruit, and develop mature eggs, but have not been induced to oviposit. Males

have been taken flying with females (*calabyi*, *macmillani*) and in a light trap (*wattensis*).

Distribution (Fig. 4). From the increasing number of records of *Chaetocruomyia* a distribution pattern begins to emerge, though there are as yet few records from Northern Territory and none from the north of Western Australia.

A. elchoensis is a species of open forests in tropical areas with over 40-inch annual rainfall, and may be sympatric with species of Group A, *tulliae* and *moloiensis*. The evidence suggests, however, that species of Group A may be largely isolated from one another geographically and/or ecologically.

A. calabyi and *wattensis* inhabit areas of less than 30-inch (mostly less than 20-inch) annual rainfall, *calabyi* in the south-west, *wattensis* in the north and east of the continent; they are apparently allopatric, but their ranges approach one another in south-east South Australia and north-west Victoria.

A. macmillani, *moloiensis* and *tulliae* inhabit eucalypt forests of eastern Australia with over 30-inch (mostly over 40-inch) annual rainfall. *A. macmillani* is a cool climate species of the south-east, extending to northern New South Wales only at higher altitudes. *A. moloiensis* ranges from south-east Queensland to the Cairns hinterland; in the south it approaches the range of *wattensis* in the Warwick-Goondiwindi area, and is apparently sympatric with *humeralis* at Eidsvold (*humeralis* may, however, be a monsoon forest species and ecologically isolated); possibly in the north it may be sympatric with *tulliae*, but records of *tulliae* in the Tully-Cairns area are from the coast with over 80-inch rainfall, whereas *moloiensis* is from a locality at higher altitude and with under 60-inch rainfall (some other species of mosquitoes found in south Queensland are known in north Queensland only from the Atherton-Mt. Molloy area). *A. tulliae* occurs in tropical coastal areas from Tully north, and in mountain country on Cape York Peninsula.

Geographically the range of *spinosipes* overlaps that of *tulliae* and *moloiensis*, but *spinosipes* is a rainforest species and ecologically isolated. Nothing is known of the distribution or ecology of "species B".

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